



CSTB gene

cystatin B

Normal Function

The *CSTB* gene provides instructions for making a protein called cystatin B. This protein reduces the activity of (inhibits) enzymes called cathepsins. Cathepsins help break down certain proteins in the lysosomes (compartments in the cell that digest and recycle materials). While the specific function of cystatin B is unclear, it may help protect the cells' proteins from cathepsins that leak out of the lysosomes.

One region of the *CSTB* gene has a particular repeating sequence of 12 DNA building blocks (nucleotides) written as CCCC-G-CCCCG-CG. This sequence, called a dodecamer repeat, is usually repeated two or three times within a part of the gene that helps regulate cystatin B protein production.

Health Conditions Related to Genetic Changes

Unverricht-Lundborg disease

In almost all affected individuals, Unverricht-Lundborg disease is caused by an increased number of copies (expansion) of the dodecamer repeat in the *CSTB* gene. Most people with this disorder have more than 30 repeats of the dodecamer sequence in both copies of the *CSTB* gene.

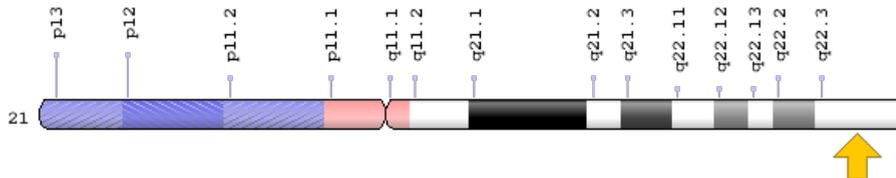
In a small number of individuals, one copy of the *CSTB* gene has the expanded dodecamer repeat while the second copy carries one of nine other identified mutations. Some of these mutations substitute one protein building block (amino acid) for another amino acid in the cystatin B protein. Others result in a shortened protein that may function improperly or not at all, or cause the protein to be pieced together incorrectly. Only one individual with Unverricht-Lundborg disease has been reported to have mutations other than the dodecamer repeat expansion in both copies of the gene in each cell.

The expanded dodecamer repeat in the *CSTB* gene seems to interfere with the production of cystatin B protein. Levels of cystatin B in affected individuals are only 5 to 10 percent of normal, and cathepsin levels are significantly increased. These changes are believed to cause the signs and symptoms of Unverricht-Lundborg disease, but the specific mechanism is unknown.

Chromosomal Location

Cytogenetic Location: 21q22.3, which is the long (q) arm of chromosome 21 at position 22.3

Molecular Location: base pairs 43,773,665 to 43,776,375 on chromosome 21 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- CPI-B
- CST6
- cystatin B (stefin B)
- CYTB_HUMAN
- EPM1
- liver thiol proteinase inhibitor
- PME
- stefin B
- STFB

Additional Information & Resources

GeneReviews

- Unverricht-Lundborg Disease
<https://www.ncbi.nlm.nih.gov/books/NBK1142>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28CSTB%5BTIAB%5D%29+OR+%28cystatin+B%5BTIAB%5D%29%29+OR+%28%28EPM1%5BTIAB%5D%29+OR+%28STFB%5BTIAB%5D%29+OR+%28cystatin+B%5BTIAB%5D%29+OR+%28CPI-B%5BTIAB%5D%29+OR+%28stefin+B%5BTIAB%5D%29+OR+%28liver+thiol+proteinase+inhibitor%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1440+days%22%5Bdp%5D>

OMIM

- CYSTATIN B
<http://omim.org/entry/601145>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
<http://atlasgeneticsoncology.org/Genes/CSTBID40181ch21q22.html>
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=CSTB%5Bgene%5D>
- HGNC Gene Family: Cystatins, type 1
<http://www.genenames.org/cgi-bin/genefamilies/set/966>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=2482
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/1476>
- UniProt
<http://www.uniprot.org/uniprot/P04080>

Sources for This Summary

- Alakurtti K, Virtaneva K, Joensuu T, Palvimo JJ, Lehesjoki AE. Characterization of the cystatin B gene promoter harboring the dodecamer repeat expanded in progressive myoclonus epilepsy, EPM1. *Gene*. 2000 Jan 25;242(1-2):65-73.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/10721698>
- Alakurtti K, Weber E, Rinne R, Theil G, de Haan GJ, Lindhout D, Salmikangas P, Saukko P, Lahtinen U, Lehesjoki AE. Loss of lysosomal association of cystatin B proteins representing progressive myoclonus epilepsy, EPM1, mutations. *Eur J Hum Genet*. 2005 Feb;13(2):208-15. Erratum in: *Eur J Hum Genet*. 2005 Feb;13(2):264.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15483648>

- OMIM: CYSTATIN B
<http://omim.org/entry/601145>
- Ceru S, Rabzelj S, Kopitar-Jerala N, Turk V, Zerovnik E. Protein aggregation as a possible cause for pathology in a subset of familial Unverricht-Lundborg disease. *Med Hypotheses*. 2005;64(5): 955-9.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15780491>
- Houseweart MK, Pennacchio LA, Vilaythong A, Peters C, Noebels JL, Myers RM. Cathepsin B but not cathepsins L or S contributes to the pathogenesis of Unverricht-Lundborg progressive myoclonus epilepsy (EPM1). *J Neurobiol*. 2003 Sep 15;56(4):315-27.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/12918016>
- Joensuu T, Kuronen M, Alakurtti K, Tegelberg S, Hakala P, Aalto A, Huopaniemi L, Aula N, Michellucci R, Eriksson K, Lehesjoki AE. Cystatin B: mutation detection, alternative splicing and expression in progressive myoclonus epilepsy of Unverricht-Lundborg type (EPM1) patients. *Eur J Hum Genet*. 2007 Feb;15(2):185-93. Epub 2006 Sep 27.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/17003839>
- Lalioti MD, Antonarakis SE, Scott HS. The epilepsy, the protease inhibitor and the dodecamer: progressive myoclonus epilepsy, cystatin b and a 12-mer repeat expansion. *Cytogenet Genome Res*. 2003;100(1-4):213-23. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/14526183>
- Lehesjoki AE. Molecular background of progressive myoclonus epilepsy. *EMBO J*. 2003 Jul 15; 22(14):3473-8. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/12853462>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC165608/>
- Moulard B, Darcel F, Mignard D, Jeanpierre M, Genton P, Cartault F, Yaouanq J, Roubertie A, Biraben A, Buresi C, Malafosse A. Founder effect in patients with Unverricht-Lundborg disease on reunion island. *Epilepsia*. 2003 Oct;44(10):1357-60.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/14510831>
- Moulard B, Genton P, Grid D, Jeanpierre M, Ouazzani R, Mrabet A, Morris M, LeGuern E, Dravet C, Mauguière F, Utermann B, Baldy-Moulinier M, Belaidi H, Bertran F, Biraben A, Ali Chérif A, Chkili T, Crespel A, Darcel F, Dulac O, Geny C, Humbert-Claude V, Kassiotis P, Buresi C, Malafosse A. Haplotype study of West European and North African Unverricht-Lundborg chromosomes: evidence for a few founder mutations. *Hum Genet*. 2002 Sep;111(3):255-62. Epub 2002 Jul 23.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/12215838>
- Shahwan A, Farrell M, Delanty N. Progressive myoclonic epilepsies: a review of genetic and therapeutic aspects. *Lancet Neurol*. 2005 Apr;4(4):239-48. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15778103>

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